

# In-Space Manufacturing of Astronaut Clothing

Completed Technology Project (2017 - 2018)



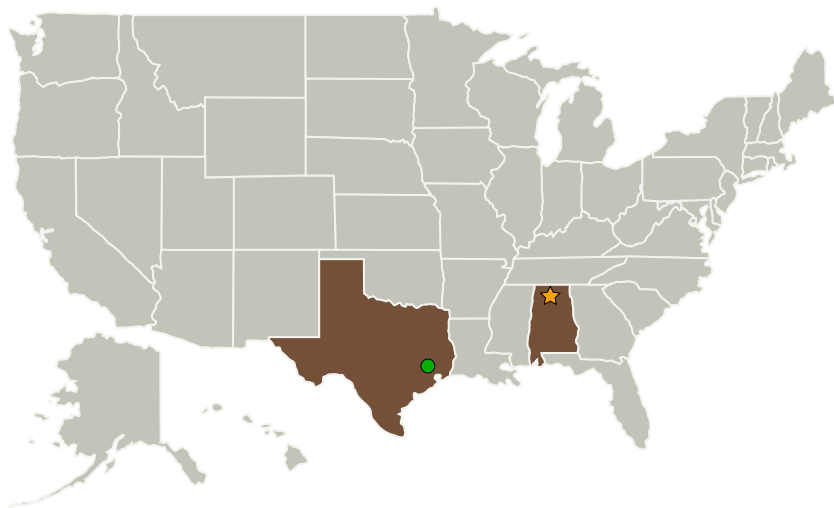
## Project Introduction

We propose an in-space manufacturing solution to produce and recycle crew clothing. Due to the versatility of polyester materials, a detailed study will be conducted to evaluate recycling of polyethylene terephthalate (PET), flame retardants compatibility with existing ECLS systems, and of blends of PET with the inherently flame retardant polyimide 84 (P84). The final deliverable of this effort will be a design concept for a miniaturized clothing recycler.

## Anticipated Benefits

On the International Space Station (ISS) clothing is treated as a consumable. Once sufficiently worn by the crew, it is discarded and replaced. For missions beyond low Earth orbit, this approach will prove infeasible due to high logistic and resupply costs. Laundry facilities have been considered and developed to mid-technology readiness levels. However, these facilities invariably require considerable water, add complexity to the Environmental Control and Life Support (ECLS) water recovery system due to the presence and challenge of handling soaps, and require considerable design complexity for microgravity operation.

## Primary U.S. Work Locations and Key Partners



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Astronaut Clothing

## Table of Contents

Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Project Website:	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

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Organizations Performing Work	Role	Type	Location
★ Marshall Space Flight Center (MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
● Johnson Space Center (JSC)	Supporting Organization	NASA Center	Houston, Texas

## Primary U.S. Work Locations

Alabama	Texas
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## Project Transitions

▶ **October 2017:** Project Start

✓ **September 2018:** Closed out

**Closeout Summary:** This project explored the possibility of manufacturing and recycling crew clothing in-space. This effort resulted in the design and fabrication of a miniature PET yarn production stand and demonstrated the production of single-strand yarn, recycled from PET fabric. Blended yarns containing both PET and P84 were also produced in an effort to address flammability concerns. Materials produced from this effort will be tested at JSC in FY19.

## Project Website:

[https://www.nasa.gov/directorates/spacetech/innovation\\_fund/index.html#.VQ](https://www.nasa.gov/directorates/spacetech/innovation_fund/index.html#.VQ)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Marshall Space Flight Center (MSFC)

**Responsible Program:**

Center Innovation Fund: MSFC CIF

## Project Management

**Program Director:**

Michael R Lapointe

**Program Manager:**

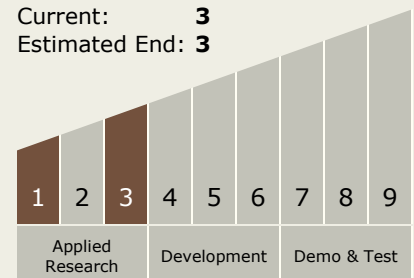
John W Dankanich

**Principal Investigator:**

Morgan B Abney

## Technology Maturity (TRL)

Start: **1**  
Current: **3**  
Estimated End: **3**



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## Technology Areas

### Primary:

- TX07 Exploration Destination Systems
  - └ TX07.2 Mission Infrastructure, Sustainability, and Supportability
    - └ TX07.2.1 Logistics Management

## Target Destinations

Earth, The Moon, Mars